

ART. II. OBSERVATIONS ON THE LIFE HISTORY OF A NEW ^E
CHALCIDOID WASP, AN INTERNAL PARASITE
OF ANT-LION LARVAE

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(One plate)

During the summer of 1940, two ant-lion cocoons, *Myrmeleon im-maculatus* De Geer, collected at Presque Isle, Erie, Pennsylvania, were found to be parasitized by a chalcidoid wasp belonging to the genus *Stomatoceras* (family *Chalcididae*). One adult wasp emerged from each cocoon. Both individuals were females. Further collections of host material, both larvae and cocoons, were made during July 1941. From this host material forty-five parasites, comprising both males and females, were reared. Several more of the parasites were taken in the field, and the process of oviposition was observed both in the field and in captivity. Dissection revealed pupal cases of the wasp within the remains of the ant-lion larvae.

It was at first thought that this *Stomatoceras* material from Presque Isle might prove to be a new species. However, in the writer's opinion, the material should be considered, for the present at least, as a variety of *Stomatoceras rubra* Ashmead,¹ and as such it is here described.

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***Stomatoceras rubra* Ashmead *erionensis*, new variety**

Female: length 4.7 mm. Head barely as wide as the thorax, antero-posteriorly thin and somewhat depressed between the lateral ocelli. The distance between each lateral ocellus and the eye margin equal to the diameter of the ocellus; the posterior edge of the median ocellus not quite reaching the vertex. Eyes prominent, with a very few short widely scattered hairs. Face long, triangular in appearance. Clypeus short, lower margin gently concave. Labrum visible. Left mandible bidentate; (the right mandible concealed in the holotype, but in other specimens tridentate). Maxillary palpi 4-jointed; labial palpi 3-jointed. Cheeks

¹ Ashmead, W. H., *Trans. Amer. Ent. Soc.*, vol. 21, p. 332, 1894.

rimmed posteriorly by a sharp thin carina. Head, excepting antennal furrow, hairy and closely pitted with coarse punctures, each puncture enclosing a hair. Antennal furrow delicately cross-striated. Antennae 11-jointed, situated close together just above the clypeus; a carina present between their scrobes. Scape equal to about one-half the length of the flagellum, and extending to the upper (posterior) margin of the median ocellus. First funicle joint the longest. Following joints of flagellum gradually diminishing in length with the exception of the apical joint which is nearly equal to the first funicle joint. The ring joint a little longer than broad—almost quadrate. Pedicel equal to the third funicle joint. Pubescence of antennae appearing slightly longer and denser from tip of pedicel to and including the first funicle joint.

Thorax slightly longer than wide. Prothorax transverse quadrate,



FIG. 1. *Stomatoceras rubra eriensis*

Left figure, outline of antenna of female, x 15; right figure, outline of antenna of male, x 16.

though somewhat declivous anteriorly; the sides but not the notum bordered anteriorly by a carina. Parapsidal furrows complete. Axillae not meeting at base of scutellum. Scutellum bounded laterally by a carina which posteriorly forms the two small lobes or teeth typical of the genus. Below the carina bounding the scutellum is an area bordered below by a second carina; this area is traversed by rugae connecting the two carinae. Prothorax, mesonotum, and upper portion of the scutellum thickly pitted with coarse punctures. Metepisternum punctate and hairy. Propodeum short, declivous, aerolated by numerous rugae; hairy at the lateral angles. Propodeal spiracles thin, slit-like, directed toward scutellum. All coxae with short silvery hairs. Lower margin of hind femora not markedly convex; denticular ridge straight (slightly notched in some specimens). Hind tibiae two-spurred, the outer spur minute—much the shorter of the two. Forewings overlapping abdomen, fuscous with an embrowned area below the point where the submarginal vein joins the marginal. A hyaline area extends from the embrowned

portion to a short distance beyond the postmarginal. Both embrowned and hyaline areas extend a little less than halfway to the posterior edge of the wing. *Pubescence of wings brown; no silvery white pubescence in the hyaline area.*

Abdomen globose. First segment the longest, dorsally extending slightly more than half the length of the abdomen. The second, third, fourth, and fifth segments very short, very finely roughened; the second, fourth, and fifth subequal, each dorsally equal to about one-sixth of the first segment; the third segment small, forming a barely visible transverse strip. Posterior margins of the third, fourth, and fifth tergites concave. *The sixth tergite forms a vertical plate which is furnished with conspicuous punctures. Ovipositor not visible; the sheaths visible, but not projecting beyond the sixth tergite.*



FIG. 2. *Stomatoceras rubra eriensis*

Left figure, outline of head of female, front view, x 13; right figure, outline of head of male, x 13.

General body color dark red except for the following structures which are black: antennae, excepting ring and first funicle joint; anterior margin of mesonotum, posterior third of mesonotum, extreme antero-lateral angles of parapsides together with the adjoining portion of prothorax and tegulae, axillae at anterior angles; metathorax except median spot of red; propodeum, mesosternum, metasternum, front and middle tibiae except apices; inner faces and proximal tips of front femora; mid-trochanters and mid-femora, mid- and hind tarsi except apices; hind tibiae except apices; denticulate portion of hind femora, and median portion of first abdominal tergite.

Ring joint and first funicle joint fusco-rufous; in life this portion of antennae appears pale silvery. The middle femora somewhat suffused with fusco-rufous on outer sides. The apices of front and middle tibiae, all of fore tarsi, apices of mid- and hind tarsal joints fusco-rufous. A faint touch of blackish on occiput, vertex, parapsidal furrows, dorsal surface of scutellum, and lower margin of sixth tergite.

Male: length 3.7 mm. Head not as long as in female. Eyes hairy. Ring joint and first funicle joint of antennae apparently fused together, forming a 10-jointed antenna. Antennal scape equal to about one-third the flagellum, barely reaching the median ocellus. Pedicel smaller than than any of the funicle joints.

Thorax similar to that of female. Lower margin of hind femora convex; denticulate ridge with an incision so that proximal six to nine denticles appear to be on a prominence. Forewing similar to that of female.

Abdomen small, globose, length 1.4 mm. First abdominal tergite the longest, equal to half the abdomen; the second, third, fourth, fifth, and sixth tergites nearly equal in length, the third being smaller than the others. Hind margins of the second and third tergites appear concave when seen from above. All tergites very finely roughened; the fourth, fifth, and sixth with some coarse punctures.

Color black; inner portions of tarsal joints, particularly at apices, tinged with fusco-rufous.

Size and color: the females of the paratype series show considerable variation in both size and color. The largest specimen is 4.9 mm. in length, the smallest 3.6 mm. The average size of all the female type specimens (including the holotype) is 4.5 mm.; however the majority of the specimens exceed this figure. The lightest colored specimen of the female paratypes has only the tibiae, anterior and posterior margins of the mesonotum, anterior edges of parapsides, mesosternum, metasternum, and basal portion of the antennal scapes, black. The darkest female specimen has the head and thorax almost entirely black, and the abdomen heavily suffused with black.

The males of the type series range in size from 3.6 mm. to 4.4 mm. The average size of the males is 4.1 mm., but the majority of the specimens exceed this figure.

VARIETAL DIFFERENCES SUMMARIZED

The chief differences between *S. rubra* Ashmead² and the variety *eriensis*, as shown by female specimens, are summarized as follows:

1. The general color of *eriensis* is much darker red than *rubra*. As mentioned previously, the head and thorax are almost uniformly black in the darker specimens of the *eriensis* paratype material. In both light

² Of the four types (all females) designated by Ashmead, only the two deposited at the U. S. National Museum have been examined by the writer.

and dark specimens the tibiae are black. The body color of *rubra* tends more to orange rufous with no such black coloration as mentioned above.

2. In the *rubra* types, the wing cilia in the hyaline area immediately behind the marginal vein are silvery white and appear slightly flattened. The wing cilia of *eriensis* are entirely dark with none appearing flattened.

3. The hind femur of *eriensis* does not have the lower margin as decidedly convex nor the denticulate ridge as deeply notched as in *rubra*.

4. The abdomen of *eriensis* is globose; the abdomen of *rubra* is pointed ovate. Also all of the tergites of *eriensis* are sculptured, the first to fifth tergites with reticulations and the sixth with coarse punctures. The first tergite of *rubra* is smooth, the second to fifth not as distinctly reticulate as in *eriensis*, and the sixth tergite is not punctate.

5. In average size, the females of *eriensis* are slightly (0.5 mm.) larger than *rubra*; however, because of the few *rubra* specimens available, size differences should not be stressed at present.

MATERIAL EXAMINED

Holotype: female, Presque Isle, Erie, Pa., July 10, 1941. Taken while ovipositing on an ant-lion larva.

Allotype: male, which emerged from cocoon of ant-lion parasitized by holotype.

Paratypes: twenty-nine females and eighteen males all from Presque Isle, Erie, Pa. Two females taken in the field; July 11, 1933, and July 18, 1941. The other females were all reared from host material; one specimen reared July 1940, the remainder during July and August, 1941. All males, except one, reared during July, August, and September; the specimen excepted was taken on July 18, 1941.

Holotype and allotype in the collection of the Carnegie Museum; paratypes in the Carnegie Museum, and the United States National Museum, Washington, D. C.

In addition to the Presque Isle specimens and the two types of *Stomatoceras rubra* studied, other material, here considered as a variety of *Stomatoceras rubra*, has also been examined. This additional material includes the following specimens: (1) at the U. S. National Museum—a female specimen from Brownsville, Texas; four female specimens from Beach, North Dakota; a female specimen from Raleigh, North Carolina; and a female reared from *Myrmeleon immaculatus* at Medora, Kansas, by R. C. Smith; (2) at the Academy of Natural Sciences of Philadelphia—

a female specimen from Montana determined as *Stomatoceras rubra* Ashmead (the identification label being in Ashmead's handwriting); two females and a male from North Woodbury, New Jersey; and a female specimen bearing only the label "Dac." All of these specimens are apparently intermediate between the *rubra* types and *eriensis*, but are closer to the latter. The females possess the lighter color of *rubra*, and the wing ciliation of *eriensis*. The abdomen is globose and sculptured as in *eriensis*. The male specimen at the Academy of Natural Sciences agrees with the males of *eriensis* except that the prominence on the denticulate ridge is not as pronounced as in *eriensis*. Possibly these specimens may represent a separate variety of *rubra*. In order to ascertain this point, however, it seems best to wait until further reared series are available, and also to learn more of the distribution of both *rubra* proper and of *eriensis*.

LIFE HISTORY

Parasitism of *Myrmeleon immaculatus* in North America has been previously recorded by Smith,³ and by Balduf.⁴ Both of these references pertain to the rearing from ant-lion cocoons by Smith⁵ of chalcidoid specimens, which were identified as *Stomatoceras* sp. Other parasites of *Myrmelionidae* have been mentioned by Wheeler.⁶

Oviposition of *Stomatoceras rubra* var. *eriensis* takes place on the active ant-lion larva in the latter's pit. Successful oviposition by *eriensis* in the field was observed on one occasion, and an unsuccessful attempt was observed at another time. In this last instance, the parasite was inadvertently disturbed after it had inserted the ovipositor, but before egg-laying had been completed. In addition to these two cases, oviposition by *eriensis* in vials was noted once. In a number of other cases, ant-lion larvae in vials were stung, but no egg was deposited.

In searching for the host, the females of *S. r. eriensis* walk slowly about over the sand—the antennae being bent downward and rapidly tapped or vibrated against the ground. They evince great interest in small depres-

³ Smith R. C., *Journ. Kan. Ent. Soc.*, vol. 7, no. 4, p. 137, 1934.

⁴ Balduf, W. V., *The Bionomics of Entomophagous Insects*, pt. II, John S. Swift Co., Inc., St. Louis, Mo. (1939), p. 326.

⁵ One of which is the specimen previously mentioned as having been studied by the author at the U. S. National Museum.

⁶ Wheeler, W. M., *Demons of the Dust*. W. W. Norton & Company, Inc., New York (1930), p. 139.

sions, furrows, footprints, etc. When a suitable ant-lion pit is found, the wasp takes up a position facing upward on the side of the pit. In this position the parasite may remain motionless for a considerable period of time providing the ant-lion has shown signs of activity. If the ant-lion senses the presence of the wasp, it begins the characteristic procedure of flipping sand from the lower portion of the pit, causing the sand around the sides of the pit to slide downward. With the commencing of this "flipping" and the downward slide of the sand, the parasite slightly elevates its wings and spreads its hind legs. In this position it slides backward into the jaws of the ant-lion larva and is pulled under the sand. Insertion of the ovipositor and the consequent release of the wasp from the ant-lion's mandibles evidently take place immediately. In the cases observed, the ant-lion, after pulling the wasp under the sand, could be detected moving hastily about. In one instance the attacked ant-lion came to the surface of the sand in its endeavors to escape. Oviposition behavior was easily observed with a hand lens in those cases where an egg was actually in the process of being deposited. The ovipositor is inserted in the prothorax of the host, the wasp standing either to one side of the mandibles or on the head of the ant-lion. The antennae and fore legs are folded downward, the parasite being supported by the ovipositor, hind, and mid-legs. When the egg has been deposited, the antennae begin to vibrate, and the ovipositor is withdrawn. The exact time required for oviposition was not ascertained; however the length of time from the moment the parasite is seized to the time the ovipositor is withdrawn is judged to be about two minutes.

Successful oviposition on ant-lion larvae in captivity was accomplished only by a single specimen—the holotype (the same specimen that was observed completing oviposition in the field). Captive recently emerged female parasites would use the ovipositor only as a means of defense, and then not always successfully. In all cases, however, the "flipping" activity of the ant-lion caused an immediate cessation of walking on the part of the wasp, and the assumption of the characteristic attitude of lifted wings, and extended hind legs.

The parasitized ant-lion larvae appeared to be partially paralyzed, able only to feebly move their heads and mandibles. They eventually formed cocoons but did not pupate, the parasites emerging from the enclosed larvae. Parasites were never observed to emerge from larvae not enclosed in cocoons. The ant-lion larvae which were stung in self defense by young females of *eriansis* eventually died without forming co-

coons. Larvae in which *eriensis* had oviposited, as well as those larvae which merely had been stung, did not construct pits and were indifferent to food, *i.e.* live insects placed with the larvae in vials.

As stated before, two instances of successful oviposition were observed. In the case where oviposition took place in the field, the egg was deposited on July 10, 1941, and the adult male offspring (the allotype) emerged September 6. The exact day on which the host larva spun its cocoon is not known, but it was sometime between August 4 and 23. In the case of oviposition in captivity, the egg was deposited July 10, the host larva had spun a cocoon by the morning of July 11, and a female parasite emerged August 22.

The proportion of parasitism of host material collected during 1941 was approximately 41 percent. Of 177 host cocoons, 45 gave rise to adult parasites, 28 were found by dissection to be parasitized, and 104 were not parasitized. No cases of secondary parasitism were observed.

EXPLANATION OF PLATE

Stomaloceras rubra variety *eriensis*

Figures 1-3, photographed by transmitted light.

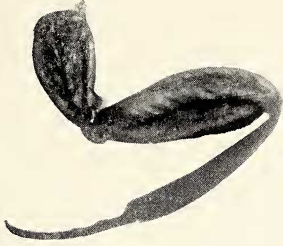
FIG. 1. Hind leg of female ($\times 13$).

FIG. 2. Hind leg of male ($\times 13$).

FIG. 3. Forewing of male ($\times 13$).

FIG. 4. Side view of male ($\times 8$).

FIG. 5. Cocoon of ant-lion host, *Myrmeleon immaculatus* De Geer, showing emergence aperture of adult parasite ($\times 3$).



1



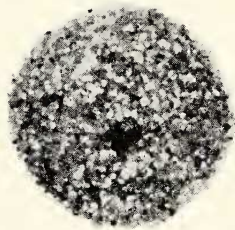
2



3



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